Space Situational Awareness

Space Weather Workshop
27 Apr 2011

AFSPC/A5C

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Today's Warfighter Depends on Space & Cyberspace

MISSILE WARNING

COMMUNICATIONS

WEATHER

NAVIGATION

PRECISION STRIKE

INTEL, SURVEILLANCE & RECONNAISSANCE

MISSILE DEFENSE

SPACE ACCESS

SPACE SURVEILLANCE

Space & Cyberspace capabilities shape the American way of warfare

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Space in Daily Living

FINANCE

PRECISION FARMING

BROADCASTING

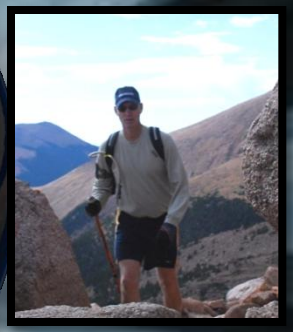
COMMUNICATIONS

WEATHER

LOGISTICS

SCIENCE

Space capabilities are embedded throughout our economy



NAVIGATION

AVIATION

SPACECRAFT

LAUNCH & OPERATIONS

USER EQUIPMENT

$261B Global Space Economic Activity

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Space Environment is Changing






Reversible

Contested

Non-Reversible

GPS Jamming | SATCOM Jamming | Laser Blinding | Interceptors | Ground Site Attack | NUDET in Space

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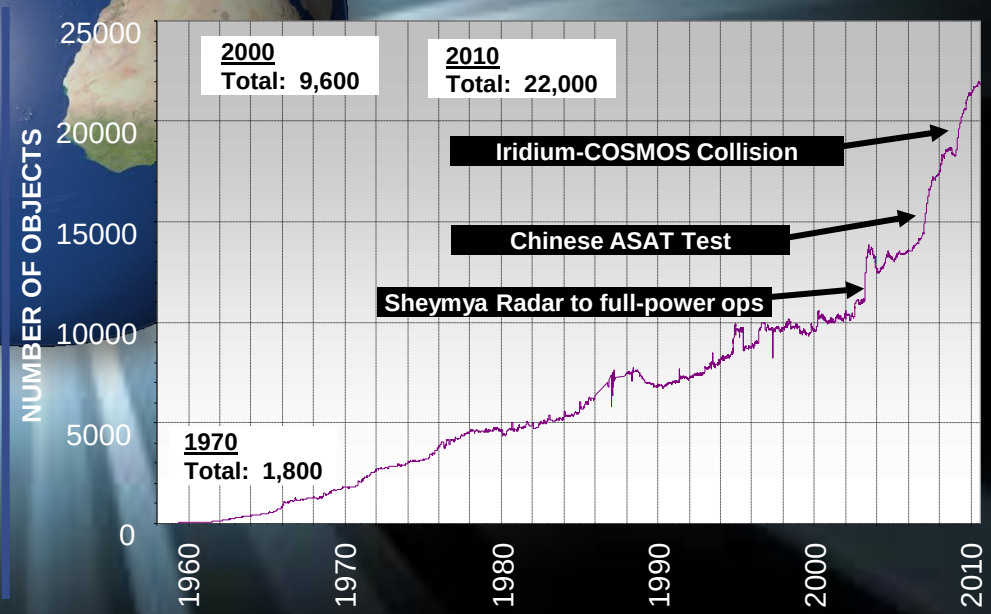
Space Faring Nations

1990 → 2010

Competitive



Congested

National Space Policy, June 2010 International Cooperation

- **"The United States hereby renews its pledge of cooperation in the belief that with strengthened international collaboration and reinvigorated U.S. leadership, all nations and peoples—space-faring and space-benefiting—will find their horizons broadened, their knowledge enhanced, and their lives greatly improved "**
- **As goals, the US will "Expand international cooperation on mutually beneficial space activities to … enhance collection and partnership in sharing of space-derived information " and "Strengthen stability in space through … improved information collection and sharing for space object collision avoidance"**
  - **"Identify potential areas for international cooperation that may include … space surveillance for debris monitoring and awareness"**
  - **"Augment U.S. capabilities by leveraging existing and planned space capabilities of allies and space partners"**
  - **"Collaborate with industry and foreign nations to: maintain and improve space object databases; pursue common international data standards and data integrity measures; and provide services and disseminate orbital tracking information to commercial and international entities, including predictions of space object conjunction"**

National Space Policy, June 2010 SSA

- **The United States shall:**
  - **"Develop, Maintain, and use space situational awareness (SSA) information from commercial, civil, and national security sources to detect, identify, and attribute actions in space that are contrary to responsible use and the long-term sustainability of the space environment"**
- **The Secretary of Defense and the Director of National Intelligence … shall:**
  - **"Maintain and integrate space surveillance, intelligence, and other information to develop accurate and timely SSA. SSA information shall be used to support national and homeland security, civil space agencies, particularly human space flight activities, and commercial and foreign space operations"**
  - **"Improve, develop, and demonstrate, in cooperation with relevant departments and agencies and commercial and foreign entities, the ability to rapidly detect, warn, characterize, and attribute natural and man-made disturbances to space systems of U.S. interest"**
- **"The Secretary of Defense shall be responsible, with support from the Director of National Intelligence, for the development, acquisition, operation, maintenance, and modernization of SSA capabilities"**

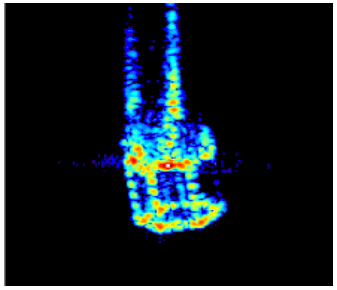
What is Space Situational Awareness?

SSA is knowledge of all aspects of space.

Achieving it requires:

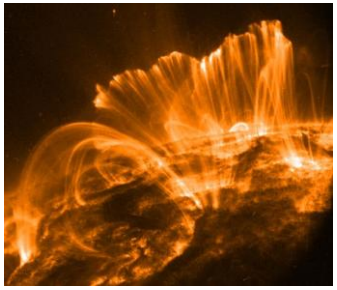
Friendly Force Status **of space assets, capabilities, and operations**

Detailed *reconnaissance* of space objects of interest

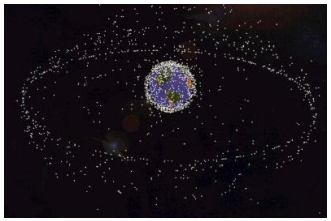


Intelligence **on adversary space activities**

Monitoring and analyzing conditions in the space *environment*

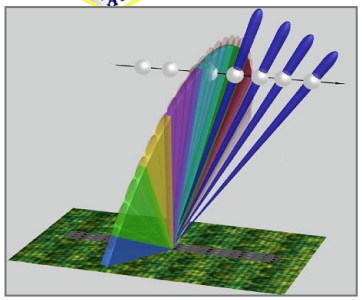


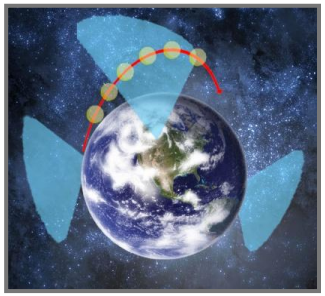
Surveillance **of all space objects and space activities**



Conducting *integrated* tasking, processing, fusion, analysis, dissemination, archiving

SSA System Development



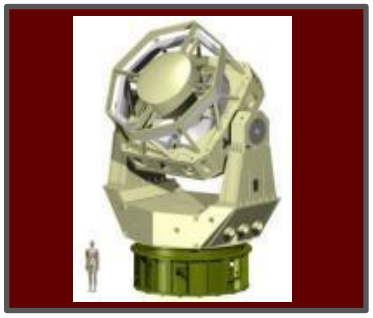


Space Fence

*Replaces AFSSS with system of three sites worldwide (more responsive **coverage**) to find smaller space objects and fix / track them*

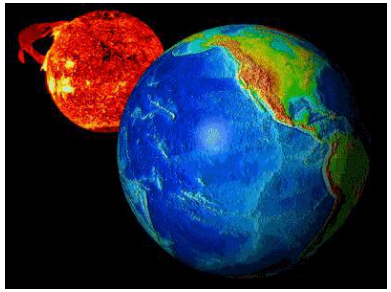
Space-Based Space Surveillance (SBSS)

Single satellite replaces legacy Space-Based Visible sensor; responsively find, fix, and track space objects in Near-Real Time



DARPA Space Surveillance Telescope (SST)

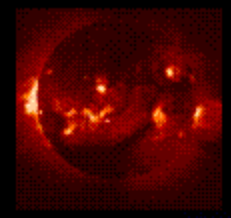
Single site (notional 3-5 sites) to find smaller space objects in deep space and fix/track them



Space Environmental Monitoring (SEM)

SSAEM (SSA Environmental Monitoring)
SEM Aurora (Possible Hosted Payload)
DSCOVR (AF Providing Launch Services)

SSA Environmental Effects Characterization OV-1



Space-Based Environmental Sensors (DoD, Civil, National, Commercial platforms)

Strategic

Operational

Tactical Level Effects Analysis

Integrated SSA Space Tasking Cycle

STRATCOM/GOC

JFCC SPACE/JSpOC

Forces

GIG

JTFs

CAOC

Multiple Centers Specification/ Forecast/Tools Net Centric DB

Ground-Based Environmental Sensors--DoD, Civil, National,

Federal/Civil/Local/Other Users can use SEEC Knowledge Enabling Tools to Determine NRT and Predicted Environmental Effects

JSpOC Mission System (JMS)

- JMS replaces current Command and Control (C2) systems with transformational SSA and Space C2 capabilities
- Service Oriented Architecture designed to operate Net-Centrically
- Enables the JSpOC to Monitor, Assess, Plan, & Execute space forces

All Source Data

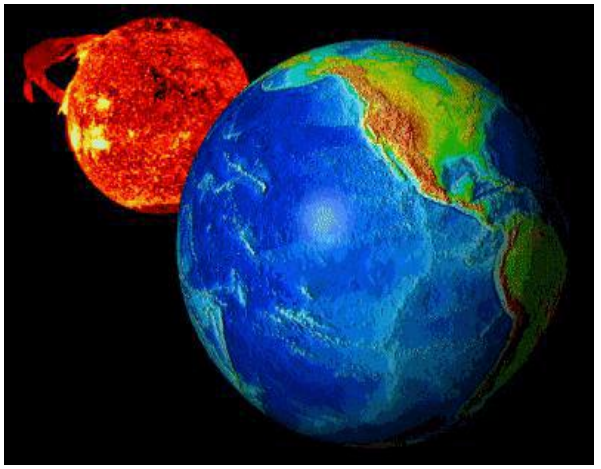
Recent events highlighted urgency to provide near term improvements to our critical SSA & Space C2 capabilities *(AFSPC/CC, May 2009)*

Encouraging News from the DoD

- **Space Weather aligned with Space Situational Awareness mission under AF Space Command and STRATCOM**
  - **Current FY12 Budget includes ~$260M across the FYDP for space- based space weather sensing capabilities**
- **OMB has designated $50M and AF $85M in FY12 for FY14 DSCOVR launch**
- **DMSP has two satellites left to launch in the morning orbits**
  - **Include space weather sensors on-board to continue the legacy of ionospheric modeling**
- **SSAEM program is pursuing a partnership with NOAA to deliver 6 space weather sensor suites for integration onto 6 low inclination COSMIC 2 spacecraft**
- **DoD plans on hosting SEM-N on their DWSS environmental monitoring satellite**
- **DoD evaluating space environmental rideshare opportunities**
- **JSPOC Mission System (JMS) requires SWx-effects assessment and prediction capabilities to be implemented**

Summary

- Evolving SSA & C2 to meet new needs and new customers… to include working with interagency, commercial, and international partners



- Requires large and varied architecture of capabilities… achieved with interagency, commercial, and international cooperation

- Information, products, services made available to users… to include interagency, commercial, and international cooperative partners

Questions?